B individual task in physics:

Edited at 7am 20.3.2017.

s is your student number. k = s mod 10000. T = s mod 100. m = s mod 35. a = s mod 25.

L = s mod 10. . e = s mod 8. m7 = s mod 7. m6 = s mod 6. m4 = s mod 4. m3 = s mod 3.

1. Find x and y for projectile with x0 = y0 = 0, v0 = T m/s, t = T seconds, A = T degrees.

Find maximum distance and maximum height.

2. Solve the projectile problem for V0 = T meters per second and A = T degrees.

3. Solve Newton differential equation for the projectile with x0 = y0 = 0, v0 = T m/s, A = T degrees.

4. Solve the soccer projectile problem for d = (11-1/T) meters and h = (2.5-1/k) meters.

You must hit the top corner of the soccer goal with the sizes of 7.5 meters per h meters from the penalty spot of d meters. V is the initial velocity. A is the angle of release. The radius of the soccer ball is 0.1 meters. Neglect air resistance. Consider the ball as a material point at the center of mass of the spherical soccer ball.

Solve the differential equations. Find the arbitrary constants from the boundary conditions or initial conditions.

Find the shortest possible time to hit the top corner of the soccer goal with the initial velocity V = 30m/s.

Find the minimum V and the corresponding to it A.

Find the minimum V and A of the direct kick, when the ball is never above the target.

Find the length of the path of the soccer ball and average velocity.

Find the minimum initial velocity of release for the direct hit and the corresponding angle of release. Is the smallest possible velocity enough for the direct hit?

What shot is the most difficult to save, why?

Would V = *a* meters per second be enough to reach the target? If yes, then find the corresponding A and the time of the motion.

Would V = *a* meters per second be enough for the direct kick? If yes, then find the corresponding A and the time of the motion.

Would A = *T* degrees allow to reach the target? If yes, then find the corresponding V and the time of the motion.

Would A = *T* degrees allow the direct kick? If yes, then find the corresponding V and the time of the motion.

https://en.wikipedia.org/wiki/Direct\_fire

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5. Solve the Badminton Projectile Problem:

You hit the shuttle from the distance d = (2 – 1/k) meters at the height h = (1 – 1/n) meters and the shuttle must hit the ground on the other side of the net (1.5m in height) as quickly as possible or as close to the net as possible. Neglect the air resistance. The size of the shuttle is 6cm, consider the shuttle as a sphere, as a material point in its center of mass. What are the best angles of release A for the closest fall, for the quickest fall, if V=6m/s? How different are the distances and the times? What is the smallest initial velocity V and the corresponding A? Find the length of the path of the badminton shuttle and the average velocity. What shot is the most difficult to save, why? Find the minimum initial velocity of release for the direct hit and the corresponding angle of release. Is the smallest possible velocity enough for the direct hit? This is similar to what happens during the badminton serve.

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6. Find angular velocity and linear acceleration for v = T m/s and R = k meters.

7. Find velocity and acceleration for one-dimensional motion with the equation x = -k + Lt + Tt2.

8. Add, subtract and multiply the vectors (T,k) and (L,s).

9. Calculate the final speed after absolutely inelastic collision of two balls of masses L kg and T kg, moving with velocities s m/s and k m/s respectively.

10. Find the acceleration of a simple pulley for two masses: L kg and T kg.

11. Find acceleration of a mass at the inclined plane with A = T degrees and the friction coefficient μ = 1/T.

Games:

12. Join Dota2 gaming competition.

http://www.dota2.com/international/overview/

13. Play chess at chess.com

Project:

14. Improve your project.

Write the proposal.

Prepare to present your project to a native English speaking doctor of science.

Deadline: 25.3.2017.